Does university choice drive graduates' employability?

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The Italian case[1]

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Abstract

Universities have come under increasing pressure to become key drivers of economic development in the age of the knowledge economy. Yet we know very little about the impact of university quality and scientific excellence on the probability of graduates finding jobs. This paper investigates the determinants of Italian graduates' employability 1-year and 3-years after graduation, with special reference to university quality measured in terms of research performance. Our results confirm that the 'better' the university, the higher the likelihood that graduates will be employed. We also observe strong effects associated with field of study, and wide regional differences.

Keywords: University quality; returns to education; labour market outcomes, employment.

JEL Codes: I23; J24

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1 Introduction

Despite the agreement that the probability of employment after graduation is strongly determined by the type of secondary schooling and university discipline chosen - combined with individual characteristics such as gender, marital status, presence of children – there is less consensus about how the choice of a university, and thus its quality, impacts on employability. Regardless of the difficulties involved in a standard approach to measuring university quality (Black and Smith, 2006; Bratti *et al*. 2004; Smith *et al*., 1999), lack of data allowing individual and institutional characteristics to be matched has meant that this issue has been relatively unexplored and information on the impact of university quality on labour market outcomes for tertiary graduate students is relatively scarce. Although this is an open issue, there is a body of empirical evidence showing that scientific excellence has positive effects on local economic development processes, technology transfer, and firms' innovation activity (Geuna and Muscio, 2009), and that 'good' universities may act as magnetic poles for good brains (Ciriaci, 2010).

Since 2000, the Italian Government has introduced several initiatives and reforms aimed at raising quality standards in Italian universities and the participation rate of young people in higher education, and at adapting the supply of human capital to the growing demand for skilled labour in the knowledge-based society. Despite this, to our knowledge there has been no attempt since these reforms were implemented, to assess the role of university quality as a determinant of Italian graduates' employability. The present paper investigates the impact of university quality on both short and medium-long term employability (1 and 3 years after graduation) of those Italian graduate students who completed their studies under the 'new university system'. To this end we use individual-level data from the most recent survey conducted by the Italian National Statistical Institute (ISTAT) on labour market entry conditions for a cohort of 2004 Italian graduates, three years after graduation (ISTAT, 2009). This database is matched with data on university quality, published by the Italian National Evaluation Council (CIVR),[2] an institutional body of the Italian Ministry for Education, University and Research (MIUR). To our knowledge, this is the first work to assess the role of university quality on both short and medium-long term employability, using CIVR data on scientific excellence.[3] We control for the impact on employability of a set of personal characteristics and family and educational background of the graduate, and characteristics of the local labour market.

The analysis is conducted at the Italian NUTS3 territorial level to allow a better match between employment outcomes and local labour market conditions. In fact, given the

2 They are used to evaluate the efficiency and the effectiveness of universities' activities, to evaluate development plans and to assess the Italian university system.

3 Earlier ISTAT surveys on labour market entry conditions of Italian graduates provide information on graduate employment only 3 years rather than 1 year after graduation.

existence of significant regional structural differences in the levels of demand for labour,[4] which are well documented in the Italian economic literature on the persistence of socio-economic divergences between central-northern and southern regions[5] (Graziani, 1978; Saraceno, 1983), these aspects need to be taken account of in assessing the employability of graduates. Thus, the role of university quality as an employability-enabler might differ across the Italian territory.

The paper is organized as follows: Section 2 presents a review of the literature on the labour market outcomes of graduate students; Section 3 describes the dataset, and presents and discusses the estimated equation; Section 4 discusses the empirical results for the determinants of employment probabilities for Italian graduates, one and three years after graduation. Section 5 presents some concluding remarks and provides some implications for policy.

2 University quality and the determinants of graduate employment: A literature review

There is a great deal of empirical evidence in the economic literature on the employment outcomes of graduates - measured commonly as earnings, and over-education (the extent to which graduates are employed in non-graduate jobs). Less attention has been paid to the impact of university choice on the probability of finding a job. This is due perhaps to the fact that most of the literature is based on UK and US evidence, where more importance is given to the quality of the employment obtained than to the probability of being employed, since the former is seen increasingly as a key indicator of success in a competitive market. However, in countries, such as Italy, that are characterized by significant unemployment of graduates, the employability of the young and skilled labour force is a crucial issue.

There are several ways that university quality (measured by spending per student, staff-student ratios, quality of research, etc.) might influence labour market outcomes. McGuiness (2003) points out that, *ceteris paribus*, resource levels are generally linked to teaching standards and teaching quality. The quality of research is associated with human capital improvements through the influence of peer group learning and spillovers from better quality academic environments (McGuinness, 2003), and for potential employers are a signal of quality (Spence, 1973). Furthermore, other

4 In fact, demand for skilled and unskilled labour differs significantly throughout the Italian territory (Ciriaci, 2007; Brunello *et al*., 2001), and especially between the central-northern and southern regions. In the latter, unemployment tends to be structural; in the former it is cyclical (Ciriaci, 2007 and 2005).

5 In this paper, Italian central-northern regions are Lazio, Tuscany, Umbria, Marche, Emilia-Romagna, Liguria, Valle d'Aosta, Piedmont, Lombardy, Trentino A.A., Friuli Venezia-Giulia, Veneto. The southern regions are Campania, Abruzzi, Molise, Puglia, Basilicata, Calabria, Sicily and Sardinia, which comprise the so-called 'Mezzogiorno'.

university reputation related benefits might originate in the more influential networks which generally characterize more selective or private universities (Brunello and Cappellari, 2008; McGuinness, 2003).

In general, the empirical results of the literature on the role of university reputation on graduates' labour market outcomes tend to differ depending on the country considered. The labour market outcomes of UK graduates (Hussain *et al*., 2009; Bratti *et al*., 2004; Bratti, 2002; Smith and Naylor, 2001; Dolton and Vignoles, 2000; Smith *et al*., 1999) depend to a limited extent on the university attended, particularly when university rankings are adjusted for individual characteristics (d'Hombres *et al*., 2008), while studies in the US support the existence of a significant positive relation between the reputation of the university or college and a graduate's labour market performance (Black and Smith, 2004; Brand and Halaby, 2006; Card and Krueger, 1992). For instance, McGuinness (2003), assessing the impact of university quality on the labour market outcomes of a cohort of UK graduates, after controlling for pre-entry qualifications, finds that they depend more on the subject studied and the degree obtained, than on the university attended. In other words, in the UK job market it is the quality of the student rather than the quality of the university attended that is more important. Thus, for most students, the choice about which university to apply to is less important for determining labour market success than the choice of which subject to study, and the type of degree obtained (McGuinness, 2003). Different results emerge from the strand of the literature that focuses on the role of university quality in the US: it is generally recognized that college quality matters for labour market outcomes, although, in terms of eventual earnings, the percentage of variance explained by total college quality tends to be small (James *et al*., 1989).

To our knowledge, there are only three studies focusing specifically on the impact of university quality on labour market performances of Italian graduate students. For instance, D'Hombres *et al*. (2008) investigate what determines the labour market performance of Italian 2001 *Laurea* graduates. They show that, controlling for pre-university performance, family background is not significantly correlated with the labour market outcomes of these Italian graduates but that there is significant correlation with the degree studied. They also find wide regional differences.

Brunello and Cappellari (2008) investigate what determines the earnings and employment prospects of Italian graduates. They find that the *Alma Mater* has an influence on the probability of being employed and on the net monthly wages of Italian graduates, at least in the short run: college related differences are significant both among and within Italian regions, but not sufficiently large to trigger substantial mobility flows from poorly performing to better performing universities. The authors find that attending a private university – conditional on the field of study – has a significant payoff. Furthermore, the student-lecturer ratio, and the number of students in the college negatively affect employment earnings. Finally, Di Pietro and Cutillo (2006) investigate whether university quality is a significant determinant of the labour market outcomes of Italian graduates measured as graduate over-education (the extent to which Italian graduates are employed in non-graduate jobs), and earnings. As a proxy

for university quality they use the performance-based, university league tables published by La Repubblica.[6] Both Brunello and Cappellari and Di Pietro and Cutillo employ individual level data on 1998 Italian graduates interviewed three years after graduation, published by ISTAT (2001). The main empirical finding from these two studies, and the most relevant to the present work, is that graduates from research-oriented universities are likely to achieve better labour-market performance than their peers who graduate from less research-active institutions, which is in line with the results for the US labour market.

3 Empirical analysis

3.1 Description of the data

In line with current debate on the role and importance of university quality, and the recent changes to the architecture of the Italian higher education system, the analysis focuses on the effect of university quality on the employability of Italian graduates. To this end, we use individual-level data from the most recent survey of Italian graduates, conducted by ISTAT to investigate graduates' labour market entry conditions. The survey was conducted in 2007 on a cohort of students who graduated in 2004 and included 47,342 individuals, interviewed by Computer Assisted Telephone Interview (CATI). They represent 17.3% of the cohort of 2004 Italian graduates (260,070 individuals). The sample includes 47% male graduates and 53% female graduates.[7] The respondents attended university courses in 16 different scientific disciplines in 67 universities. The ISTAT survey collects information on previous educational attainment, degree results, employment status, and parents' socio-economic status, as well as a range of personal characteristics. The data were matched with ISTAT NUTS3 regional data on unemployment and value added.

Table 1 reports information on students' employment after graduation: 73.2% of graduates found a job within 3 years and 11.7% of students were already employed before graduating (data are weighted with the carry-over coefficients of the original universe). Employment rates are significantly higher for those who graduated in the scientific areas of engineering, architecture, teaching, political science and economics-statistics. The low employment rates found for law and medicine are explained by the further formal professional training needed in these cases. This would seem to be

6 These performance indicators reflect the analysis conducted by the Centre for Social Studies (CENSIS, 2000) and are available at faculty level, based on raw data from a number of sources including ISTAT and MIUR.

7 The same data are available for graduates who attended private universities. Thus, our analysis includes graduates from both public and private universities; most existing empirical work (e.g. Di Pietro and Cutillo, 2006) studies only graduates from public universities.

confirmed by the fact that graduates from these disciplines have the lowest probabilities (respectively 36.4% and 52.5%) of finding work soon after graduation (*see* section 4.2).

<Table 1 HERE>

There are also wide differences in graduate employment in the Italian territory, confirming the lower labour absorption capacity of the southern regions. Three years after graduation, 65 out of 100 graduates in the southern region are in employment, while in the Central-Northern region the rate of employment is 11 points higher - 76 out of 100 (Ciriaci, 2009; SVIMEZ, 2009). Three years after graduation, 34,000 out of 96,576 graduates from universities in southern Italy (35.2%) were unemployed, 78% of whom live in the Mezzogiorno. Among southern graduates in employment in 2007, 41.5% - 26,000 out of 62,576 - were working in a Central-Northern region, and this percentage has been increasing over time - 39.5% in 2004, 31% in 2001 (Ciriaci, 2005). The empirical evidence also confirms that studying in a central-northern university brings high returns in terms of employability: the rate of unemployment among southern graduates who studied in a central-northern university is 28.9%, significantly lower than the 35.1% who attended a southern university (Ciriaci, 2009).

Finally, 12.1% of graduates three years after graduation are unemployed and 14.7% stated that they are not even looking for a job (and only 8% are involved in training activities). In other words, in 2007 almost 26.8% of 2004 graduates were not working. Unemployment is particularly high in psychology (25.9%), literature (22.5%), and geo-biology (24.1%).

3.2 University quality in Italy

The Italian Government has introduced radical changes to the structure of university degrees in Italy, aimed at increasing the participation rate of young people in higher education, adapting the supply of higher education courses to the demand for tertiary education, and the supply of human capital to the growing demand for highly educated labour in the knowledge society. This transformation is affecting many aspects of the university system: the length of undergraduate degree programmes, the content and structure of degrees, the distinction between first level (bachelors) degrees and second level (post-graduate) degrees following a '3+2' model,[8] and the pre-requisites for and objectives of degree programmes (Boero *et al.*, 2001). Alongside this deep *Bologna*

8 The objective of the Bologna process is to create a European Higher Education Area by 2010. It involves a series of reforms to harmonize degree structures and increase the competitiveness and the attractiveness of the European higher education system (D'Hombres, 2007).

process reform, there has been an increase in the autonomy of universities in terms of course organization, and financial aspects.

In its attempt to improve the efficiency and effectiveness of the higher education sector in Italy, the Italian Government has encouraged the publication of university performance measures. Thus, in 2005 CIVR conducted its Three-Year Evaluation of Research (VTR), the first national evaluation of research activity in Italy covering research activities conducted in the period 2001-03 (MIUR, 2007). The VTR targets the research performance of 102 universities and public research centres, which were required to submit a predefined number of research outputs (books, book chapters, journal articles, patents and other types of economic valorization of research results, manufactured and artistic products) to an expert panel for peer review. The number of research outputs per institution is based on the size of the university (measured as full-time-equivalent research staff). The VTR rates and ranks university research performance, assessing a certain number of research outputs defined on the basis of university size. Each research output is rated on the basis of a peer review evaluation (excellent=1.0, good=0.8, acceptable=0.6, poor=0.2, not classifiable=0). The weighted sum of the ratings divided by the number of products submitted to the evaluation provides a score – a rating - for each academic institution reviewed. This is the only national level research assessment exercise carried out by a government institution in Italy.

For the present analysis, the ISTAT database on the labour market entry conditions for 2004 Italian graduates is matched with the CIVR university-level data on Italian university quality.[9] This allows us to use institutional level evaluation ratings, classified by scientific areas. The previous work on the effect of university quality on the early labour market performance of Italian graduates, uses the performance-based university league tables published by *La Repubblica.*

Table 2 reports the Top-15 Italian universities by student attendance and VTR rating. MIUR (2007) classifies universities according to size as follows: small universities up to 10,000 students; medium universities 10,000 to 15,000 students; large universities 15,000 to 40,000 students; mega universities over 40,000 students. In our sample 36.3% of graduates attended a mega university, 48.0% attended a large university, 7.7% attended a medium university and 8.0% were enrolled at a small university. Enrolment of over 50% of the students interviewed by ISTAT was split across 15 university institutions. The majority of the students surveyed studied at one of five large institutions: Bologna, Padova, Roma 'La Sapienza', Torino and Milano. The majority of

9 Analysis of the significant shortcomings of aggregate university performance measures is beyond the scope of this paper (for a discussion *see* Black and Smith, 2006; Bratti *et al*. 2004). There is no substantial agreement in the literature on the appropriateness of the performance indicators covering different scientific areas or on their returns to scientific productivity and academic prestige. It has been pointed out that research assessment exercises often explicitly ignore the publications of most full-time researchers, on the grounds that they are employed on fixed term contracts. This does not apply to the VTR evaluation which does not explicitly exclude fixed term employed researchers' outputs from the evaluation, and includes a weighting for staff affiliation (e.g. publications with two authors from two different institutions are weighted 50% to each institution).

the top-15 academic institutions reported in Table 2 received an average VTR rating of 0.82, well above the national average of 0.77 (as specified above, scores range from 0 to 1.0). Almost all academic institutions are based in central-northern Italy.

<Table 2 HERE>

Table 3 reports the distribution of university attendance by scientific area. The majority of graduates included in the sample were enrolled in medical faculties (24%) or on courses in economics-statistics (11.8%) and engineering (10.6%).

<Table 3 HERE>

4 Econometric analysis

4.1 The estimated equation

In order to investigate the determinants of Italian graduates' employability, the probability of being employed (1 and 3 years after graduation) is modelled as follows:

$$P_{ij\,ur} = \beta_0 + \mathrm{X}_{ij\,ur}\beta_1 + G_{ij\,ur}\beta_2 + Q_{ij\,ur}\beta_3 + E_{ij\,ur}\beta_4 + R_{ij\,ur}\beta_5 + \varepsilon_{ij\,ur} \quad (1)$$

where i = 1…47,342 (individuals interviewed); j= 1…15 (field of study); u: 1…64 (universities attended); r = 1…103 (Italian provinces[10]). Given the non-linearity of the employed/not employed *status*, we adopt a probit econometric approach: the dependent variable $P_{ij\,ur}$ takes the value 1 if individual i is employed, and 0 otherwise. Specifically, we employ a robust weighted probit regression model in which the individual weights are the carry-over coefficients of the original universe.

Similar to the existing studies on labour market outcomes, the analysis relies on the assumption that the relevant variables have not been omitted (Hussain *et al.*, 2009). In fact, the most problematic issue is how to deal with the characteristics of students entering higher education, which, in the available data, are either not measured or are poorly measured. The problem of self-selection (e.g. Chiswick, 2000; Borjas, 1987) arises in this kind of analysis: certain characteristics/skills may make it more likely that

10 Italian provinces correspond to NUTS3 units in the Eurostat classification of administrative units in Europe.

some individuals enrol at a university and complete their studies (graduate). It follows then, that employed graduates may not be representative of a random sample of the source province population, but rather a sample systematically selected from the relevant distribution.[11]

For this reason, we include the set of control variables X_{ijur} with information related to the respondent's personal characteristics, and family and education background. Personal characteristics include sex, age, marital status, and progeny. In particular, being married may provide an incentive to find a job, especially for males given that in Italian households they usually have the greater financial responsibility (Di Pietro and Cutillo, 2006). In line with previous work (Di Pietro and Cutillo, 2006; Dolton and Vignoles, 2000), we control for being female, with children, since the decision to participate in the labour force is likely to be non-random. That is, information on the presence of children is used as an exclusion restriction since it is likely to influence the labour supply, especially of female graduates. Age is expected to negatively affect the probability of finding a job, based on the assumption that the older the graduate, the longer the period he/she needed to complete his/her higher education studies. While sex, age and family are clearly observable, there are unobservable individual characteristics such as, ability and ambition, and for this reason we include controls for education history. These include student's high school type, his/her high school and university performance and attainment of post-graduate qualifications (second level degree, one and/or two year master's course, diploma degree). Thus, we assume that conditional on high school and university performance, student quality is the same across disciplines (d'Hombres *et al*., 2008). Among the variables related to family background, we consider education level and parents' professions (based on the assumption that the value of networks is higher for individuals from a well educated family; Brunello and Cappellari, 2008; Brunello and Checchi, 2005).

Hence, education and family background are assumed to be sufficient to capture innate individual ability, level of human capital accumulated by the student, and income constraints, which are expected concurrently to affect the choice to enrol at a university, which university to attend, and labour market outcomes. Clearly, ambition is unobservable. As individuals also may be self-selected on the basis of field of study, we include a set of 14 faculty group dummies (G_{ijur}).[12]

Also, to take account of the wide labour market economic differences that characterize the Italian territory, the unemployment rate is included to account for local labour market characteristics. Finally, since there is theoretical and empirical evidence to show that human capital accumulation is faster in bigger metropolitan areas (Glaeser and Resseger, 2010; Glaeser and Mare, 2001), we control for the existence of agglomeration economies (the ratio of value added of the administrative province in which the

11 See Heckman and Robb (1985).

12 The regressions do not take account of individuals that graduated from the areas of physical education and defence and security because there are no university quality data available for these areas.

individual is resident, and national value added, averaged over 2001-05). These last two variables are included in R_{ijur}.

The paper focuses mainly on the set of estimated coefficients ($\hat{\beta}_3$): conditioned on the control variables included in equation (1), they are interpreted as the marginal contribution of the quality and prestige of the university from which the student graduated, to the graduate's employability. As noted by Black and Smith (2006), most previous studies on the impact of university quality on labour market outcomes employ a single measure of university quality in regressions such as (1). Underlying this choice is the idea that university quality can be captured by some latent unobserved quality measure, which can be proxied by a single observed measure. However, as university quality is a multi-dimensional attribute (Hussain *et al*., 2009), we prefer to consider a set of university quality variables (Q_{ijur}) including the ranking of the university attended by individual i (measuring the 'prestige' of the university), university size, and the number of students per lecturer. Finally, as private universities provide valuable network effects (Brunello and Cappellari, 2007), and may facilitate the access of graduates to employment, a dummy is included to control for this effect.

Table 4 presents the control and explanatory variables included in the model and Table 5 reports the descriptive statistics. The following section reports the results of the econometric analysis.

<Table 4 HERE>

<Table 5 HERE>

4.2 Estimation of the determinants of graduate employment one and three years after graduation

This section provides empirical evidence on the determinants of graduates' employability within one year and three years after graduation. The results are reported respectively in Table 6 and Table 7. Since the dependent variables are based on discrete choices (employed/not employed), in both cases we employ probit models and calculate the corresponding marginal/impact effects, which are reported in the last column in both tables.[13]

13 Logit regressions provide remarkably similar econometric results.

The results of the first regression show that students' personal characteristics and family background have little effect on employability immediately after graduation. None of the control variables is significant except for the variable *married_or_divorced*, which shows that marital status provides an extra incentive to find a job immediately after completing studies (or to settle for a second-best job).

Being in employment while attending university has a positive and significant impact on the probability of finding a job quickly, while enrolment on a post-graduate course (one or two-year masters courses or a two-year degree) has obvious negative effects. Graduation from a three-year degree positively affects graduates' employability, once we control for those who started a postgraduate course. In this respect, as evidenced by ISTAT (2009), graduates enrolled on three-year courses are more likely to start working before the conclusion of their university course. In fact, 30.2% of four-year degree graduates started working while still students, compared to 37% of three-year degree graduates (ISTAT, 2009). It could be argued that those students who graduate from a three-year course and decide not to go on to a two-year degree course or a masters course are more motivated to work or are among those who are already employed. For field of studies, the results suggest that Geo-biology, Economics, Law, Political Sciences, Literature and Psychology graduates have relatively lower probabilities of being employed one year after graduation than graduates from other scientific disciplines. However, these latter include areas where a relatively higher percentage of graduates is enrolled in a postgraduate course and where the transition to paid jobs is longer, for example, the case of Law and Literature students (ISTAT, 2009).

The results for the impact of university characteristics on the probability of finding a job within one year after graduation are interesting. Studying in a larger institution does not have a relevant effect on employability (*university_size*): therefore, bigger universities do not provide better education or better signalling effects for employers. What is important, is studying in scientifically reputable universities. The sign of the variable *university_rating* is strongly significant and positive and the corresponding marginal effect indicates that a 1-point increase in VTR rating provides a 0.46-point increase in the probability of being employed one year later (in 2005). On the other hand, studying in a private university (*university_private*) or studying in a university with better lecturer-per-student ratios (*n_students_per_lecturer*) does not significantly affect employability in the short run. Finally, as expected, the higher the unemployment rate in the province where the graduate is living (*local_unemp_rate*), the lower the probability of finding employment one year after graduation. On the other hand, living in a province characterized by higher value added (*added_val_uni/tot*) does not affect employability. It could be argued that labour market conditions prevail over the relative magnitude of the industrial activity in the area being considered. In other words, what matters is not residence in a metropolitan area, but where there is demand for labour, and these two characteristics are not necessarily correlated.

The results show that in terms of graduates being employed within a year of graduation there is some kind of trade off between local availability of jobs and the scientific prestige of the academic institution attended. In other words, students living in areas characterized by relatively high rates of unemployment will benefit from graduating from a prestigious institution because this will increase substantially their chances of finding work. This leads to the conclusion that students living in areas with plenty of

work opportunities do not need to bother so much about university quality because they are likely to find work no matter where they have studied.[14]

<Table 6 HERE>

Although the main results of the estimation of the determinants of employability one year after graduation are substantially confirmed by the results of the regressions for employability three years after graduation, there are some differences. In the longer term, students' characteristics and family background become more important. Being a female, and especially with children, negatively affects the probability of finding a job within three years after graduation. The effects are similar for parents' educational attainment levels, which negatively affect employability. In other words, the lower the educational level of the parents, the higher the probability that the graduate will (have the necessary drive to search for and) find a job (or will settle for a second-best option). Because of the high positive correlation between education level and income level, if we assume that the level of education of a graduate's parents is a proxy for his/her socio-economic background (data on family's income are not available), the empirical findings would suggest that the incentive to find a job is higher for graduates with lower family economic status.

As expected, being in employment prior to graduation positively affects the probability of being employed three years after graduation. As far as field of study is concerned, 2004 graduates from Geo-Biology, Law and Psychology have a lower probability of being employed in 2007 than graduates from other scientific areas. However, in line with the empirical literature on Italian labour market outcomes of tertiary education (ISTAT, 2009; Ciriaci, 2007, 2005; ISTAT, 2006) graduates in engineering, economics-statistics, political-science, chemistry-pharmaceutics, and architecture are more likely to be employed in the long run. Moreover, enrolment on a postgraduate course positively affects graduates' employability except in the case of the two-year '*laurea specialistica'* postgraduate degrees: the probability of being employed three years after graduation is lower for graduates who choose the 3+2 degree course. On average, a masters course is more beneficial in terms of getting a job, most probably because of agreements with private organizations for sponsorship for masters students which allow students to participate in training programmes and/or look for work.

The estimates indicate that neither studying in a large institution nor in an institution with better lecturer per student ratios has a relevant effect on employability. In contrast, the coefficient of university rating is, as in the previous case, statistically significant and,

[14] The use of dummies for students' location in central-northern Italy or southern Italy provide econometric results that are consistent with the results using the variables *local_unemp_rate* and *added_val_uni/tot.* We could not use these dummies in the regressions because of obvious correlation problems.

as expected, positive. Graduating from research-oriented institutions that score well in quality evaluations, pays off in terms of long-term employability. The corresponding marginal effect indicates that a 1-point increase in the VTR rating provides a 0.25-point increase in the probability of being employed in 2007. Moreover, studying in a private university increases the chances of long-term employability. In line with previous empirical studies (Brunello and Cappellari, 2005), this suggests that private universities are involved in valuable networks and have efficient careers services available to their graduates. Similar evidence is found in the case of prestigious research institutions. In fact, there is empirical evidence that research prestige is associated with extensive university-industry networks (Smith and Katz, 2000).

<Table 7 HERE>

5 Conclusions

This paper investigated the determinants of Italian graduates' employability one year and three years after graduation. We focused on the impact of university choice on employability with special reference to university quality measured in terms of research performance.

We used individual-level data from the most recent ISTAT survey on labour market entry conditions, among 2004 Italian graduates, and data from the MIUR VTR research evaluation. In our investigation we controlled for the impact on employability of a number of indicators for students' characteristics and family background, on the type of university courses and the university's characteristics, and on geographic location.

The empirical analysis in this paper provides two key findings: geographical location and university quality are key enablers of employability for young graduates. The outcomes of the first result are straightforward: in order to find a job, holding all the other factors constant, graduates need to be resident in areas of low unemployment, however, if the sharp regional economic inequalities for Italy are considered, we come to the obvious conclusion that this aspect is difficult to tackle in the absence of aggressive policy measures targeting entrepreneurship, local investment and creation of favourable business conditions.

However, we can draw some relevant policy implications from the second outcome, concerning university quality. The indicator of research quality used in this paper picks up an institutional prestige effect, which has a number of positive effects for employability. Our results show that attending a good university improves employability, reducing brain waste, especially from rural areas.

Therefore, our analysis argues strongly for the promotion of policy initiatives to improve the quality of academic institutions, and the accountability of research results. The empirical evidence in this paper sheds light on the pivotal role of academic institutions in economic systems, proving that their contribution to employment growth could be substantial. The central role of universities traditionally has been to train students and prepare them for a professional career. The findings from this study show

that encouraging academic scientific research would be beneficial to this aim. The scientific prestige of academic institutions does matter and, thus, the choice of which university to enrol in may be important in terms of allowing graduates easier access to the labour market.

Our results would suggest that systemic interventions to create centres of excellence in areas such as Southern Italy would be very beneficial. Furthermore, developing centres of excellence for scientific research and framing the conditions for innovation and high tech entrepreneurship can make regions attractive to both home and foreign students and young graduates. Policies should include promotion of entrepreneurship, training and education, mechanisms influencing the allocation of capital, public research and its links with business.

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TABLES

Table 1 Work condition of Italian graduates 3 years after graduation (2007, per cent values)

Scientific areas	Working			Not working		Total
	Total	Working before graduation	Working after graduation	Looking for work	Not looking for work	(a.v.=100,0)
Sciences	67.4	6.2	61.2	13.1	19.5	3,292
Chemistry-pharmaceutics	78.6	2.4	76.1	9.3	12.2	5,594
Geo-biology	60.2	5.6	54.6	20.2	19.6	6,881
Medicine	36.4	1.2	35.2	3.9	59.7	7,888
Engineering	91.0	6.9	84.1	4.4	4.6	18,114
Architecture	88.1	15.0	73.1	8.2	3.7	8,210
Agriculture	73.3	5.0	68.3	15.3	11.4	3,907
Economics-statistics	79.8	11.7	68.1	10.7	9.5	26,437
Political sciences	80.5	19.5	61.0	14.3	5.3	15,773
Law	52.5	9.9	42.6	25.5	21.9	25,264
Literature	75.5	18.4	57.1	17.1	7.4	16,592
Languages	78.8	10.2	68.5	14.9	6.3	9,568
Teaching	82.2	20.7	61.5	13.4	4.4	9,654
Psychology	70.2	11.1	59.1	22.4	7.4	6,555
Physical education	77.0	22.0	55.0	13.3	9.7	1,387
Total	73.2	11.7	61.6	14.2	12.6	165,114

Source: authors' calculations based on ISTAT data

Table 2 Top-15 universities by attendance

		n.	%	Average VTR rating (0 to 1)
1	Bologna	2,461	5.20	0.82
2	Padova	2,284	4.83	0.86
3	ROMA "La Sapienza"	2,185	4.62	0.81
4	Torino	1,892	4.00	0.82
5	Milano	1,827	3.86	0.84
6	Pavia	1,518	3.21	0.82
7	Napoli "Federico II"	1,466	3.10	0.79
8	Firenze	1,377	2.91	0.80
9	Pisa	1,303	2.76	0.80
10	Chieti-Pescara	1,249	2.64	0.82
11	Milano Politecnico	1,236	2.61	0.83
12	Genova	1,214	2.57	0.79
13	Siena	1,203	2.54	0.82

14	Milano "Cattolica del S. Cuore"	1,149	2.43	0.81
15	Roma "Tor Vergata"	1,117	2.36	0.81
16	other…	23,810	50.35	-
	Total	47,291	100.00	

Source: authors' calculations based on ISTAT and MIUR data

Table 3 University attendance by scientific area

	n.	%
Sciences	1,710	3.62
Chemistry-pharmaceutics	2,052	4.34
Geo-biology	2,105	4.45
Medicine	11,370	24.04
Engineering	5,032	10.64
Architecture	2,299	4.86
Agriculture	1,263	2.67
Economics-statistics	5,585	11.81
Political sciences	3,885	8.21
Law	3,795	8.02
Literature	2,296	4.85
Languages	1,505	3.18
Teaching	1,478	3.12
Psychology	1,054	2.23
Physical education	1,678	3.55
Total	47,300	100.00

Source: authors' calculations based on ISTAT and MIUR data

Table 4 Variables used in the econometric regressions

Acronyms of variables	Description	Source
Dependent variables		
employed_2007	Dummy variable taking on the value one if the individual is employed in 2007, zero otherwise.	ISTAT survey
employed_2005	Dummy variable taking on the value one if the individual is employed in 2007, zero otherwise.	ISTAT survey
Student's characteristics		
female	Dummy variable taking on the value one if the individual is a female, zero otherwise.	ISTAT survey
children	Dummy variable taking on the value one if the individual has children, zero otherwise.	ISTAT survey
female_with_children	Dummy variable taking on the value one if the individual is female and has children, zero otherwise.	ISTAT survey
age_class	Age of the individual in classes (increasing from 1 to 8)	ISTAT survey
married_or_divorced	Dummy variable taking on the value one if the individual is a married or divorced/separated, zero otherwise.	ISTAT survey
Family background		

father_position	Dummy variable taking on the value one if the father of the individual is self employed or an executive/manager, zero otherwise.	ISTAT survey
edu_level_father	Indicator of the level of education attained by the individual's father.	ISTAT survey
edu_level_mother	Indicator of the level of education attained by the individual's mother.	ISTAT survey
University degree and field of study		
3yr_degree	Dummy taking on the value one if the individual concluded a first level degree, zero otherwise.	ISTAT survey
university_final_mark	Higher university score.	ISTAT survey
diploma_degree	Dummy taking on the value one if the individual concluded a diploma degree, zero otherwise.	ISTAT survey
1yr_master_degree	Dummy taking on the value one if the individual concluded a 1year master, after 3year degree, zero otherwise.	ISTAT survey
2yr_postgrad_degree	Dummy taking on the value one if the individual concluded a second level degree, zero otherwise.	ISTAT survey
1yr_postgrad_master_degree	Dummy taking on the value one if the individual concluded a 1year master after a second level degree, zero otherwise.	ISTAT survey
work_before_graduation	Dummy taking on the value one if the individual started working before graduation, zero otherwise.	ISTAT survey
Dummies for university scientific areas		
scientific_area_1	Sciences	ISTAT survey
scientific_area_2	Chemistry-pharmaceutics	ISTAT survey
scientific_area_3	Geo-biology	ISTAT survey
scientific_area_4	Medicine	ISTAT survey
scientific_area_5	Engineering	ISTAT survey
scientific_area_6	Architecture	ISTAT survey
scientific_area_7	Agriculture	ISTAT survey
scientific_area_8	Economics-statistics	ISTAT survey
scientific_area_9	Political sciences	ISTAT survey
scientific_area_10	Law	ISTAT survey
scientific_area_11	Literature	ISTAT survey
scientific_area_12	Languages	ISTAT survey
scientific_area_13	Teaching	ISTAT survey
scientific_area_14	Psychology	ISTAT survey
University characteristics		
university_rating	Average rating of the University attended	MIUR (2007)
university_size	4 University dimension dummies (small, medium, big, very big).	MIUR (2007)
university_private	Dummy taking on the value one if the University attended by the individual was private, zero otherwise.	MIUR website
n_students_per_lecturer	Number of student per lecturer in the University attended by the individual.	MIUR (2007)
Local economic performance indicators		
added_val_uni/tot	Ratio between the value added of the administrative province where the individual studied and the national value added (average 2001-05).	ISTAT National Accounts
local_unemp_rate	Average unemployment rate of the individual's administrative province of residence (in 2007) over the period 2004-07.	ISTAT National Accounts

Table 5 Summary statistics

Variable	Obs	Mean	S. E.	Min	Max	Type
employed_2007	46,196	0.71	0.45	0.00	1.00	dummy
employed_2005	12,099	0.68	0.46	0.00	1.00	dummy
gender_f	47,342	0.53	0.50	0.00	1.00	dummy
children	47,300	0.13	0.33	0.00	1.00	dummy
female_with_children	47,300	0.07	0.26	0.00	1.00	dummy
age_class	47,300	7.22	0.70	1.00	8.00	scalar (1-8)
married_or_divorced	47,301	0.27	0.44	0.00	1.00	dummy
father_position	47,301	0.05	0.21	0.00	1.00	dummy
edu_level_father	46,900	3.88	1.30	1.00	6.00	scalar (1-6)
edu_level_mother	47,092	3.71	1.25	1.00	6.00	scalar (1-6)
3yr_degree	47,301	0.44	0.50	0.00	1.00	dummy
university_final_mark	47,300	103.22	6.99	66.00	110.00	count
diploma_degree	47,301	0.42	0.49	0.00	1.00	dummy
1yr_master_degree	47,300	0.05	0.22	0.00	1.00	dummy
2yr_postgrad_degree	47,300	0.15	0.36	0.00	1.00	dummy
1yr_postgrad_master_degree	47,300	0.03	0.16	0.00	1.00	dummy
work_before_graduation	47,301	0.20	0.40	0.00	1.00	dummy
scientific_area_1	47,300	0.04	0.19	0.00	1.00	dummy
scientific_area_2	47,300	0.04	0.20	0.00	1.00	dummy
scientific_area_3	47,300	0.04	0.21	0.00	1.00	dummy
scientific_area_4	47,300	0.24	0.43	0.00	1.00	dummy
scientific_area_5	47,300	0.11	0.31	0.00	1.00	dummy
scientific_area_6	47,300	0.05	0.22	0.00	1.00	dummy
scientific_area_7	47,300	0.03	0.16	0.00	1.00	dummy
scientific_area_8	47,300	0.12	0.32	0.00	1.00	dummy
scientific_area_9	47,300	0.08	0.27	0.00	1.00	dummy
scientific_area_10	47,300	0.08	0.27	0.00	1.00	dummy
scientific_area_11	47,300	0.05	0.21	0.00	1.00	dummy
scientific_area_12	47,300	0.03	0.18	0.00	1.00	dummy
scientific_area_13	47,300	0.03	0.17	0.00	1.00	dummy
scientific_area_14	47,300	0.02	0.15	0.00	1.00	dummy
university_rating	47,291	0.79	0.05	0.52	0.92	continuous
university_size	47,291	42255.99	31459.59	459.00	132575.00	count
university_private	47,300	0.06	0.23	0.00	1.00	dummy
n_students_per_lecturer	47,291	31.37	15.98	10.43	183.91	continuous
added_val_uni/tot	46,229	0.03	0.03	0.00	0.10	continuous
local_unemp_rate	46,229	6.74	4.06	2.55	18.50	continuous

Table 6 Econometric results: Employment within 1 year from graduation

Dependent variable: employed_2005	coefficient	robust s.e.	Marginal (or impact) effect

	(1)	(2)		(3)	
female	0.022	(0.040)		0.008	§
children	0.043	(0.190)		0.015	§
female_with_children	-0.217	(0.203)		-0.081	§
age_class	0.054	(0.044)		0.019	
married_or_divorced	0.115	(0.061)	*	0.040	§
father_position	-0.128	(0.104)		-0.047	§
edu_level_father	-0.001	(0.020)		0.000	
edu_level_mother	-0.030	(0.022)		-0.011	
3yr_degree	-0.146	(0.044)	***	-0.053	§
university_final_mark	-0.001	(0.003)		-0.001	
diploma_degree	-0.074	(0.044)	*	-0.027	§
1yr_master_degree	-0.141	(0.078)	*	-0.052	§
2yr_postgrad_degree	-0.550	(0.059)	***	-0.210	§
1yr_postgrad_master_degree	-0.349	(0.105)	***	-0.132	§
work_before_graduation	0.214	(0.071)	***	0.074	§
University_rating	1.360	(0.460)	***	0.485	
university_size	0.000	(0.000)	*	0.000	
university_private	0.068	(0.090)		0.024	§
n_students_per_lecturer	0.002	(0.001)		0.001	
scientific_area_2	0.106	(0.091)		0.037	§
scientific_area_3	-0.240	(0.083)	***	-0.089	§
scientific_area_4	0.056	(0.068)		0.020	§
scientific_area_5	0.069	(0.068)		0.024	§
scientific_area_6	0.045	(0.082)		0.016	§
scientific_area_7	-0.062	(0.097)		-0.023	§
scientific_area_8	-0.134	(0.067)	**	-0.049	§
scientific_area_9	-0.139	(0.076)	*	-0.051	§
scientific_area_10	-0.599	(0.085)	***	-0.230	§
scientific_area_11	-0.399	(0.109)	***	-0.151	§
scientific_area_12	-0.113	(0.102)		-0.041	§
scientific_area_13	-0.053	(0.107)		-0.019	§
scientific_area_14	-0.363	(0.103)	***	-0.137	§
added_val_uni/tot	0.935	(0.615)		0.334	
local_unemp_rate	-0.027	(0.006)	***	-0.010	
constant	-0.336	(0.578)			
Number of obs	11586				
Pseudo R2	0.050				
Log pseudo-likelihood	-6948.160				

*** p < 0.01, ** p < 0.05, * p < 0.1

§ impact effect for discrete change of dummy variable from 0 to 1

Table 7 Econometric results: Employment within 3 years from graduation

Dependent variable: employed_2007	coefficient	robust s.e.	Marginal (or impact) effect

	(1)	(2)		(3)	
female	-0.097	(0.022)	***	-0.030	§
children	0.095	(0.098)		0.029	§
female_with_children	-0.376	(0.101)	***	-0.128	§
age_class	-0.109	(0.026)	***	-0.034	
married_or_divorced	0.199	(0.036)	***	0.059	§
father_position	0.070	(0.048)		0.021	§
edu_level_father	-0.033	(0.011)	***	-0.010	
edu_level_mother	-0.039	(0.012)	***	-0.012	
3yr_degree	0.053	(0.026)	**	0.016	§
university_final_mark	-0.002	(0.002)		0.000	
diploma_degree	-0.060	(0.025)	**	-0.019	§
1yr_master_degree	0.219	(0.047)	***	0.063	§
2yr_postgrad_degree	-0.516	(0.032)	***	-0.178	§
1yr_postgrad_master_degree	0.048	(0.069)		0.014	§
work_before_graduation	0.658	(0.052)	***	0.172	§
university_rating	0.881	(0.249)	***	0.272	
university_size	0.000	(0.000)	**	0.000	
university_private	0.243	(0.045)	***	0.069	§
n_students_per_lecturer	0.000	(0.001)		0.000	
scientific_area_2	0.253	(0.050)	***	0.071	§
scientific_area_3	-0.356	(0.048)	***	-0.121	§
scientific_area_4	0.086	(0.035)	**	0.026	§
scientific_area_5	0.364	(0.039)	***	0.101	§
scientific_area_6	0.344	(0.047)	***	0.094	§
scientific_area_7	0.069	(0.057)		0.021	§
scientific_area_8	0.158	(0.039)	***	0.047	§
scientific_area_9	0.157	(0.045)	***	0.046	§
scientific_area_10	-0.546	(0.044)	***	-0.190	§
scientific_area_11	0.014	(0.071)		0.004	§
scientific_area_12	0.166	(0.065)	**	0.048	§
scientific_area_13	0.267	(0.065)	***	0.075	§
scientific_area_14	-0.130	(0.061)	**	-0.042	§
added_val_uni/tot	1.298	(0.362)	***	0.401	
local_unemp_rate	-0.043	(0.003)	***	-0.013	
constant	1.425	(0.312)	***		
Number of obs	44715				
Pseudo R2	0.124				
Log pseudo-likelihood	-22727.225				

*** p < 0.01, ** p < 0.05, * p < 0.1

§ impact effect for discrete change of dummy variable from 0 to 1